

Semiconductor Device, Method of Manufacturing the Device and Method of  
Mounting the Device

FIELD OF THE INVENTION

5       The present invention relates to a semiconductor device including a semiconductor element and a reinforcing member bonded to a back surface opposite to an electrode-formed surface of the element with an adhesive and also relates to a method of manufacturing the device and a method of mounting the device.

10       BACKGROUND OF THE INVENTION

      A semiconductor device mounted to electronic equipment is manufactured through a packaging process of connecting pins, metallic bumps or the like of a lead frame to a semiconductor element in the form of a wafer  
15       on which a circuit pattern is formed and of sealing the element with resin or the like. With recent miniaturization of the electronic equipment, the semiconductor device has the size become small and has the semiconductor element become thin.

      The thinned semiconductor element is susceptible to a damage in a  
20       handling because of low strength of the element against external force. Accordingly, a conventional semiconductor device has the thinned semiconductor element generally sealed with a layer of resin for reinforcement.

      In a process of forming the resin layer on the surface of the thin  
25       semiconductor element, contraction and shrinkage of the resin layer likely cause a problem such as warpage and fracture to the semiconductor element. The problem becomes more apparent as the semiconductor element is thinned,

for example, an extremely thin semiconductor element having a thickness of 100 $\mu$ m or less is hardly sealed with resin.

### SUMMARY OF THE INVENTION

5 A semiconductor device includes a semiconductor element having an electrode-formed surface including an electrode for external connection formed thereon, and a reinforcing member bonded to a back surface opposite to the electrode-formed surface with an adhesive. The adhesive bonds the semiconductor element with the reinforcing member while allowing the  
10 semiconductor element to be deformed.

A method of manufacturing the semiconductor device includes a process of: shaving a back surface of a semiconductor wafer including plural semiconductor elements formed therein to thin the semiconductor wafer, a process of bonding a reinforcing member to the back surface of the thinned  
15 semiconductor wafer with an adhesive, and a process of dividing the semiconductor wafer and the reinforcing member stuck to the wafer into units of the semiconductor elements.

Another method of manufacturing the semiconductor device includes a process of: forming a diced groove along a respective border of plural  
20 semiconductor elements from an electrode-formed surface of a semiconductor wafer including the semiconductor elements formed therein, a process of attaching a sheet to the electrode-formed surface of the semiconductor wafer including the diced grooves formed thereon, a process of divide the semiconductor wafer into units of the semiconductor elements through  
25 shaving a back surface of the semiconductor wafer with the sheet attached thereto to thin the semiconductor wafer to a thickness until the back surface reaches the diced groove, a process of bonding a reinforcing plate to a back

surface of each semiconductor element with an adhesive, and a process of dividing the reinforcing plate into units of the semiconductor elements after removing the sheet from the electrode-formed surface.

Still another method of manufacturing the semiconductor device includes a process of shaving a back surface of a semiconductor wafer including plural semiconductor elements, a process of dividing the semiconductor wafer into the semiconductor elements, and a process of bonding a reinforcing member to a back surface of each semiconductor element with an adhesive.

The semiconductor device has a semiconductor element handled easily and has an increased reliability after being mounted.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A through Fig. 1D illustrate processes in a method of manufacturing a semiconductor device in accordance with an exemplary embodiment 1 of the present invention.

Fig. 2A through Fig. 2C illustrate processes in the manufacturing method of the semiconductor device in accordance with the embodiment 1.

Fig. 3 is a perspective view of the semiconductor device in accordance with the embodiment 1.

Fig. 4A through Fig. 4C illustrate processes of mounting the semiconductor device in accordance with the embodiment 1.

Fig. 5A through Fig. 5D illustrate processes in a method of manufacturing a semiconductor device in accordance with an exemplary embodiment 2 of the invention.

Fig. 6A through Fig. 6D illustrate processes in the method of manufacturing the semiconductor device in accordance with the embodiment